

Amendments to the Claims

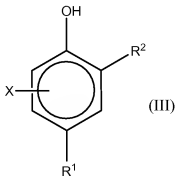
Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- Claim 1. **[Currently Amended]** A method of producing a modified chitosan polymer or oligomer, comprising **the steps of:**
- (A)** reacting an enzyme with at least one phenolic compound in the presence of a **solubilized** chitosan polymer or oligomer **in a homogeneous phase**, wherein **the reaction is carried out in a homogenous phase solution, said reaction is conducted under conditions of reactivity, solubility and enzyme activity effective to maintain said reaction in a homogeneous phase** and **producing to produce** an insolubilized modified chitosan polymer or oligomer; and **then**
- (B)** solubilizing the modified chitosan polymer or oligomer.
- Claim 2. **[Original]** The method of claim 1, wherein the enzyme is an enzyme that uses molecular oxygen as an oxidizing agent to oxidize phenolic compounds.
- Claim 3. **[Original]** The method of claim 2, wherein the enzyme is a tyrosinase, a phenol oxidase, a polyphenol oxidase, or a mixture thereof.
- Claim 4. **[Currently Amended]** The method of claim 1, wherein the at least one phenolic compound is **a** phenol, a substituted phenol, a polymer having at least one phenolic moiety or tyrosine residue, or a protein having at least one phenolic moiety or tyrosine residue.

Claim 5. **[Original]** The method of claim 4, wherein the at least one phenolic compound is a compound having the formula



wherein R^1 is hydrogen, hydroxyl, alkyl or substituted alkyl, alkenyl or substituted alkenyl, cycloalkyl or substituted cycloalkyl, cycloalkenyl or substituted cycloalkenyl, aryl or substituted aryl, amino or substituted amino, carboxylic acid or carboxylic acid ester, or an aldehyde or keto group;

R^2 is H or OH; and

X is one or more additional substituents that can be halogen, hydroxyl, alkyl or substituted alkyl, alkenyl or substituted alkenyl, cycloalkyl or substituted cycloalkyl, cycloalkenyl or substituted cycloalkenyl, aryl or substituted aryl, amino or substituted amino, carboxylic acid or carboxylic acid ester, or two adjacent substituents which are joined to form a ring.

Claim 6. **[Original]** The method of claim 1, wherein the at least one phenolic compound is selected from the group consisting of phenol, 2-chlorophenol, 2,2'-dihydroxybiphenyl, 8-hydroxyquinoline, 3-amino-phenol, o-cresol, m-cresol, p-cresol, 2,3-dimethylphenol, 2-methoxyphenol, resorcinol, l-nitronaphthol, hydroquinone, 4-chlorophenol, 4,4'-dihydroxybiphenyl, 2-aminophenol, 3-methoxyphenol, 1-naphthol, 4-phenylphenol, p-hydroxyphenoxyacetic acid, 5-methylresorcinol, tert-butylcatechol, catechol, methylcatechol, tyramine, dopamine, caffeic acid, hydroxycinnamic acid and chlorogenic acid.

- Claim 7. **[Original]** The method of claim 6, wherein the at least one phenolic compound is chlorogenic acid, caffeic acid, p-cresol, catechol, dopamine or a mixture thereof.
- Claim 8. **[Original]** The method of claim 1 wherein the at least one phenolic compound is a mixture of phenolic compounds.
- Claim 9. **[Original]** The method of claim 1, wherein the solution is an aqueous solution or an aqueous alcohol solution.
- Claim 10. **[Previously Presented]** The method of claim 9, wherein the solution has a pH of less than 6.5.
- Claim 11. **[Previously Presented]** The method of claim 9, wherein the solution has a pH of at least 8.
- Claim 12. **[Original]** The method of claim 1 wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solution.
- Claim 13. **[Original]** The method of claim 12, wherein the solution is an aqueous solution or an aqueous alcohol solution.
- Claim 14. **[Previously Presented]** The method of claim 12, wherein the reaction is carried out at a pH of 5.5 to 6.5.
- Claim 15. **[Previously Presented]** The method of claim 12, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of at least 8.
- Claim 16. **[Previously Presented]** The method of claim 15, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of 8 to 14.

- Claim 17. **[Original]** The method of claim 12, wherein the modified chitosan polymer or oligomer is soluble in aqueous acidic solutions.
- Claim 18. **[Original]** The method of claim 12, wherein the modified chitosan polymer or oligomer is insoluble in aqueous solutions having a neutral pH.
- Claim 19. **[Previously Presented]** The method of claim 10, wherein the modified chitosan polymer or oligomer is soluble in aqueous alkaline solutions having a pH of at least 8, soluble in aqueous acidic solutions, and insoluble in aqueous solutions having a neutral pH.
- Claim 20. **[Previously Presented]** The method of claim 1, wherein the said method produces a modified chitosan polymer or oligomer having a higher viscosity in solution than that of the chitosan polymer or oligomer prior to said reaction.
- Claim 21. **[Previously Presented]** The method of claim 20, wherein the viscosity of a solution of the modified chitosan polymer or oligomer is at least 1 poise.
- Claim 22. **[Previously Presented]** The method of claim 21, wherein the viscosity of a solution of the modified chitosan polymer is at least 40 poise.
- Claim 23. **[Previously Presented]** The method of claim 22, wherein the viscosity of a solution of the modified chitosan polymer or oligomer is at least 400 poise.
- Claim 24. **[Currently Amended]** A method of producing a modified chitosan polymer or oligomer, which comprises comprising the steps of:
- (a) providing a chitosan polymer or oligomer solubilized in a solution;
 - (b) reacting an enzyme with at least one phenolic compound in the presence of the said solubilized chitosan polymer or oligomer in a homogeneous phase, wherein said reaction is conducted under conditions of reactivity, solubility and enzyme activity effective

to maintain said reaction in a homogeneous phase and producing to produce an insolubilized modified chitosan polymer or oligomer; and then solubilizing said produced modified chitosan polymer or oligomer; and then

- (c) **further additionally** reacting an enzyme with at least one phenolic compound in the presence of **the said solubilized** modified chitosan polymer or oligomer **in a homogeneous phase, wherein said additional reaction is conducted under conditions of reactivity, solubility and enzyme activity effective to maintain said additional reaction in a homogeneous phase and** to produce a further modified chitosan polymer or oligomer.

Claim 25. **[Currently Amended]** The method of claim 24, which further comprises repeating step (c) to further modify the **further** modified chitosan polymer.

Claim 26. **[Previously Presented]** The method of claim 24, wherein the reaction of step (b) is carried out at a pH of 5.5 to 6.5.

Claim 27. **[Previously Presented]** The method of claim 24, wherein the reaction of step (c) is carried out at a pH greater than 6.5.

Claim 28. **[Previously Presented]** The method of claim 27, wherein the reaction of step (c) is carried out at a pH of at least 8.

Claims 29-34. **[Cancelled]**

Claim 35. **[Previously Presented]** The method of claim 1, further comprising further reacting the modified chitosan polymer or oligomer.

Claim 36. **[Previously Presented]** The method of claim 35, wherein said further reacting is performed in an alkaline solution.

- Claim 37. **[Previously Presented]** The method of claim 35, wherein said further reacting comprises reacting an enzyme with at least one phenolic compound in the presence of the modified chitosan polymer or oligomer to produce a further modified chitosan polymer or oligomer.
- Claim 38. **[Previously Presented]** The method of claim 35, wherein said further reacting comprises reacting an attached moiety of the modified chitosan polymer or oligomer, the attached moiety being derived from at least one of the enzyme and the phenolic compound.
- Claim 39. **[Previously Presented]** The method of claim 1, wherein said reacting comprises leaving an unmodified portion of the chitosan polymer or oligomer unreacted, and wherein the method further comprises separating the unmodified portion and the modified chitosan polymer or oligomer from one another.
- Claim 40. **[Previously Presented]** The method of claim 1, wherein the phenolic compound is selected from the group consisting of a phenolic protein and a phenolic peptide.
- Claim 41. **[Previously Presented]** The method of claim 24, wherein the at least one phenolic compound reacted in step (b) is different from the at least one phenolic compound further reacted in step (c).
- Claim 42. **[Previously Presented]** The method of claim 24, wherein said reacting step (b) comprises leaving an unmodified portion of the chitosan polymer or oligomer unreacted, and wherein the method further comprises separating the unmodified portion and the modified chitosan polymer or oligomer from one another prior to said further reacting step (c).

Claim 43. **[Currently Amended]** The A method of **claim 24, wherein producing a modified chitosan polymer or oligomer, which comprises reacting an enzyme with** at least one phenolic compound is selected from the group consisting of a phenolic protein and a phenolic peptide in the presence of a chitosan polymer or oligomer, wherein the reaction is carried out in a homogenous phase solution.

Claim 44-46. **[Cancelled]**